

Frequency, outcome and socio-demographic factors of common unintentional childhood poisoning, from a tertiary health-care teaching hospital of a low-income setting

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Research Article

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Abstract

BACKGROUND: Unintentional poisoning is implicated in about 2% of all injury-related deaths among children from developing countries. Poisoning ranked 2nd among commonest injury and 3rd most common pediatric ED visits. National health survey of Pakistan estimated 4.3% unintentional poisoning among children <5 years of age. Most studies focus on types of poisoning; only a few highlighted the factors associated with ingestion. Few epidemiological studies from Pakistan and the region around identified few factors associated with poisoning among children like overcrowding, maternal education, socioeconomic of the family, family type (nuclear or joint), number of siblings etc. We try to document few additional factors behind common pediatric household unintentional poisoning from the largest tertiary care teaching hospital like frequency, outcome and socio-demographic factors especially focusing on maternal education, mother on the job when the child had exposure to poison and timing of ingestion.

METHODS: This was a descriptive case series study conducted at the ED of the National Institute of Child Health (NICH), Karachi during 2017-2018. Data collection was non-probability consecutive sampling on a predesigned, tested and approved questionnaire. The sample size was 253. All children aged 12 or below of either gender, who presented with a clear history of unintentional ingestion of poison were included. Frequency and percentage were presented for the type of poisoning, absence of parent/primary caregiver, maternal education status, maternal age, maternal job, family type, family income and outcome of poisoning

RESULTS: Out of 253 observed cases 132 (52%) were male and most were <5 years of age with mean \pm SD of age 4.41 ± 3.31 (CI of 4.00-4.81) years. Around 200 (79.05%) children were exposed either during the afternoon or by early evening and mother or caregiver was not present around the child in 173 (68%) cases while the child exposed to poison. In 150 (59%) children mother age was over 30 years and 200 (79%) mothers either had tenth grade or minimal educational experience. A joint family system was present in 213 (84 %) children with more than five adult member living together mostly in a small house. The number of children (>3) living together was found in 101 (40%) cases of poisoning of which 83 (82%) were when mother was on job. The poor family class was found in 125 (49%) children, though a majority of these mothers use to do some jobs 205 (81%) either at the home or outside. Commonly ingested poisons were drugs (33.78%) and hydrocarbon (32.80%) followed by organophosphorus (16.60%) exposure. Forty-two (16.60%) children were discharged, 48(18.97%) went LAMA, 11(4.34%) expired and 152 (60.09%) admitted.

CONCLUSION: During this study it was found that certain socio-demographic factors like low parental education and socioeconomic status, larger family size or children in family, unsafe storage of medicines and household chemicals have significant effect on childhood poisoning and by addressing them we can decrease unintentional poisoning cases in children. Kerosene ingestion and easily available drugs remain the most common ingestions.

Introduction

Poisoning occurs when people drink, eat, breathe, inject, or touch enough of a hazardous substance (poison) to cause illness or death.¹ Unintentional ingestion/poisoning, continue to be a significant injury related morbidity and mortality across the world.² According to WHO (2012) data, 193,460 deaths globally from unintentional poisoning, unfortunately 84% from low to middle-income countries (1). Poisoning ranked 2nd among commonest injury and 3rd most common pediatric ED visits.³ Unintentional poisoning is implicated in about 2% of all injury related deaths among children from developing countries.⁴

Around 70% of acute poisoning occurs in pediatric population, 90% are preventable⁵. Epidemiological properties of poisoning differ like availability, socio-economic status, age, education, large family size, religious and cultural influences etc.⁶ Pediatric accidental ingestion are mothballs, flea and tick product, cleaning solutions, nail polish remover, other hydrocarbons, sanitary products and available drugs as candy.⁷

Low-middle income countries in EMRO region count mortality rates of 1.6/100,000 children, whereas for South Asian region it was 1.7/100,000 children.⁸ National health survey of Pakistan estimated 4.3% unintentional poisoning among children < 5 years of age.⁹ Children < 6 years age group are more prone to poisoning with male predominate, while mortality has been reported to be from 1–12.5% in different studies.¹⁰ Most studies focus on types of poisoning; only few highlighted the factors associated with ingestion. Few epidemiological studies from Pakistan¹¹ and region around^{12, 13} identified some of the factors associated with unintentional poisoning among children < 5 years of age like overcrowding, maternal education, socioeconomic of the family, family type (nuclear or joint), number of siblings and few more.

Pakistan lack both centralize poison center and national database resources on pediatric poisoning, there are few small, single or multiple center hospital based descriptive studies which may not reflect the actual picture of the disease magnitude and exact nature of the problem is very difficult to ascertain from these local studies.

In this context, we try to document the key factors behind common pediatric household unintentional poisoning from the largest tertiary care teaching hospital on frequency, outcome and socio-demographic factors especially focusing on maternal education, mother on job when child had exposure to poison and timing of ingestion was investigated. Furthermore we will focus on knowledge gap and aimed to derive independent solutions to the problem.

Methods

This was descriptive case series from cases visiting the Emergency Department of National Institute of Child Health (NICH), Karachi during 2017–2018, institutional review board approval and parental consent

was opted before enrolling the cases. The study protocol is performed in accordance with the relevant guidelines. The study center is a public hospital where most patients are either from semi-rural or middle to low socioeconomic class.

Data collection was non-probability consecutive sampling on a predesigned, tested and approved. Study center is the largest tertiary care hospital of the town with total ED turnover of > hundred thousand annually with admission rate of 27–35%.

Sample size was calculated by using W.H.O sample size calculator taking confidence interval of 95%, incidence of childhood poisoning 4.3% (6) with margin of error as 2.5%, an estimated sample size was $n = 253$.

All children visited the ED age 12 or below of either gender was included who present with clear history of unintentional ingestion of any substances identified as poisoning. Children who are mentally retarded, doubtful ingestion, suicidal/homicidal ingestion, brought dead or other types of poisoning like snake or dog bites.

Patient who fulfill the inclusion criteria was selected from a tertiary health care hospital. Informed consent in local language was taken from parent/guardian to become part of this study after explaining purpose of study. Possible benefits and risk from this study was explained to parents/guardian. They have right to withdraw at any time. Confidentiality and expertise were ensured to parents/guardian. Patient was followed till outcome is determine. Outcome was determined at the end of 24 hours. At the end researcher was evaluate the results of study i.e. outcome and socio-demographic factors.

Data was analyzed by using SPSS version 22. Age of patient and duration of ingestion of poison was presented as mean \pm SD. Frequency and percentage was presented for type of poisoning, absence of parent/primary caregiver, maternal education status, maternal age, maternal job, family type, family income and outcome of poisoning. Total number of family members taking medications, number of children, route of exposure to poison, place of storage of poison, any procedure done at the hospital, and any treatment given were controlled through stratification. Study outcome was performed using Analysis of the data was done using descriptive statistics like frequencies, proportions, means, median and standard deviations, Chi-square test for categorical variables and p -value ≤ 0.05 was considered as statistically significant.

Results

Out of total ED visit we observed 253 cases with confirmed history of poisoning and who gave consent to enrolled in the study. There were 132 (52%) male and 121 (48%) female cases. Regarding age distribution most were < 5 years of age with mean age of 4.41 ± 3.31 (CI of 4.00-4.81). Male predominate, however female out number male among age group of > 10 years. **Table I.**

Regarding timing of ingestion we observe most children (< 5 years) exposed during afternoon followed by evening as in **Table I**, most of the time mother or caregiver was not present around while child exposed to poison, we found 173 (68%) children mostly during afternoon and early evening time. **Figure V**. Maternal age directly correlates with exposure of ingestion, we found 150 (59%) mother with age > 30 years, similarly maternal educational status has strong relation with the exposure and we found 200 (79%) mothers either had tenth grade or minimal educational experience. **Figure II**.

Table I: Age and Gender Correlation with Time of Ingestion. (P value 0.0001)

Age	Morning (21)		Afternoon (123)		Evening (77)		Night (32)		Total (253)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
< 5 years	08	07	64	48	14	12	03	03	89	70
6–10 years	02	00	04	01	20	11	05	06	31	18
> 10 years	02	02	02	04	09	11	01	14	14	31
Total	12	09	70	53	43	34	09	23	134	119

Joint family system, number of siblings or number of family members in a house all correlates with increase chance of exposure, 213 (84%) children living in a joint family system with more than five adult member living together mostly in a small house, at-least one of them 190 (75%) are on some medications. Number of children (> 3) living together also impact the chance of exposure with 101(40%) children are exposed to poison of which 83 (82%) were when mother was on job. **Table II**

Table II: Correlation of Family System, Working Mom and Number of Children in Family. P value 0.0001

Family System	Number of Children < 3, (152)		Number of Children > 3, (101)		Total
	Mother on Job	Mom not on Job	Mother on Job	Mom not on Job	
Joint Family System	105	21	72	15	213
Nuclear Family System	17	09	11	03	40
Total	122	30	83	18	253

Family income and socioeconomic status as elaborated in **Figure III**, shows a considerable cases 125 (49%) children belong to poor family class who earn less than ten thousand a month, though majority of these mothers use to do some jobs 205 (81%) either at the home or outside.

Types of common poison ingested is described in **Figure I**, commonly ingested poison were drugs and hydrocarbon followed by organophosphorus exposure, while oral administration was the most common route with 166 cases, 11 (4.3%) children expired, 03 (1.1%) died in ED and 152 (60%) admitted. **Figure IV**. Almost all exposed children got these poison kept within their reach. Lavage was carried out in 40 cases, however induced vomiting already practiced by parents at home in 82 children.

Discussion

Accidental ingestion of substance, injurious to health is still common health problem among children from developing world; however literature is spare from South Asia including Pakistan.¹⁴ Most unintentional pediatric poisoning are preventable with little education, intervention and modification of risk factors. The study center is the largest children teaching hospital of the province which caters patients from whole of the city and around.

Age And Gender

Available literature from Pakistan identify that majority of child with unintentional ingestion were under 5years of age^{2, 15} studies have shown that age < 5 are adventurous and need to explore the world around them and use to participate in reckless actions if unsupervised and expose to injurious substances.¹⁰ Considering gender distribution we observed the same as was in most studies, males predominate female ratio of 1.3:1 in all age group, as mentioned in few studies range from 1.1–1.8:1², however children aged 10 and above we found an inverse ratio of 1:2 as female out numbers, reason behind was not investigated, interestingly most of these girls was exposed during night time this may be accidental or unintentional but suspicious of intentional may not be completely excluded because of age, level of understanding regarding poison and fear of the family.

Timing Of Ingestion And Number Of Siblings

This was also observed that timing of ingestion play an important role in exposure, and we found most children during afternoon hours interestingly around 50% of them were age five or less. It is difficult to point the reason, however as mention is previous study¹⁰, the long afternoon with warm and humid climate of Karachi mothers and other care givers use to take some rest (nap) and children use to be unattended and feel free to explore things and hazardous substances. This was not investigated in the past and need to be further evaluated. Unsupervised child during the afternoon hours lead to poison exposure either mother was out for job or caregiver was reckless. Petridou E. et.al.¹⁶ describe that absence of one parent was associated with an increased risk of unintentional poisoning. Absence of

mother during daytime due to maternal employment and lack of family support was the two most deleterious risk factors recognized in his study.^{12,17}

Literature identified that number of siblings relates to chance of poisoning exposure, we observed 40% of our children exposed to unintentional ingestion of hazardous things with > 3 siblings, literature do support this.²

Age Of Mother And Education Of Mother

Education in health also means prevention, to reduce pediatric poisoning a prevention program may be practiced in clinics, ED or in ward etc. parents need counselling, however maternal educational status and level of understanding counts a lot in perceiving and practicing the knowledge.¹⁸ Maternal education plays an important role in ingestion prevention as described by Bilal A. et.al. who identified a PAR (population attributable risk) score of 15% if maternal education level was of 10 years while it rose to 38% among mother with of no formal education.^{2,12,14} A multi-variant study demonstrates children of young mothers¹⁹ with tenth grade education were prone to poisonous exposure. Somehow similar findings we observed in our study.

Large family size seems to be protective with more available observing eyes on child, literature support with evidence, however in this study we found a reverses pattern and more children belong to joint family system with 5 or more adult members, however if there is lack of family support the risk remain high, one reason may be that our catchment area is of low socioeconomic category,²⁰ adult members may be on employment while children remain at home, this need to be evaluated further and it was missed in our study. Similarly number of children within a family is directly related to risk of ingestion which doesn't favor from our study.¹²

Types Of Poison Ingestion

Kerosene oil, as single agent is the almost the most common hydrocarbon ingested in liquid form, different category of medicine remain on the top of list.^{2,10,21,22} Kerosene oil is readily available in most houses and are still in use in stove for cooking purposes among low income families, we use it for few other purpose, hence present in most families. Accidental ingestion of hydrocarbons especially kerosene is common among children under five especially if they are kept in some containers in which the kerosene oil is stored container familiar to them like cup, can, glass, mineral water or attractive beverage bottles. Regarding another common ingestion of medicine, children use to take medicine which is readily available, looks like a candy and their curious nature of habit to follow what adults do. In this study we didn't focus on which medicine children are exposed most, this entirely depends on availability of drugs. Some of the rare ingestions like plants products, pesticides, and detergents etc which were not discussed in this study.

Outcome

We observed mortality of 4%, this seem to be a huge number however similar findings was observed by Manzar N et.al.² This is may be partially dependent on age, amount and time of ingestion, delay in seeking medical treatment, and how and what treatment were executed and socioeconomic status of family. Mortality of 11.6% was observed from India, whereas 2.5–13.6% was observed from ^{2, 15, 22} Inadequate supervision either by mother or other caregivers is one of the key factor associated with unintentional ingestion.

Limitation And Strength

This was hospital base study which is the main limitation of our study. We need to conduct community based or multicenter study with more elaborated methodology in order to highlight the actual magnitude of the disease and to identify underlying risk factors. Though the study hospital is a referral center but this didn't have toxicology department, poison center or a toxicologist.

Questionnaire was designed based on the variable available in literature was tested by study participants and institutional review board, expert review and epidemiologist input was not opted.

Data collection was not must from all cases, only those who gave consent was enrolled, hence a good number either didn't gave consent or had doubtful history of ingestion and were excluded.

Under reporting of cases who do not seek treatment at health care facility may be one factor of limited cases.

Conclusion

There are few generic factors as evident from literature which may lead to increased risk of unintentional exposure to poison among our children this includes low parental education and socioeconomic status, larger family size or children in family, unsafe storage of medicines and household chemicals, history of previous poisoning. Kerosene ingestion and easily available drugs remain the most common ingestions, younger age and male predominate from most literature.

Declarations

Ethics approval

This study was approved by ethical review committee of National Institute of Child Health Karachi.

Consent for publication

Informed consent obtained from parents.

Availability of data and materials

Most of the data generated or analyzed during this study are included in this article. Limited data can be provided in person on request to the main author.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AJ was the main author who collected data from children's parents/guardian regarding poisoning with its socio-demographic factors and analyzed and interpreted that data. SF helped in collecting and analyzing data. ES was a major contributor in writing the manuscript along with some help in data analysis. All authors read and approved the final manuscript.

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Figures

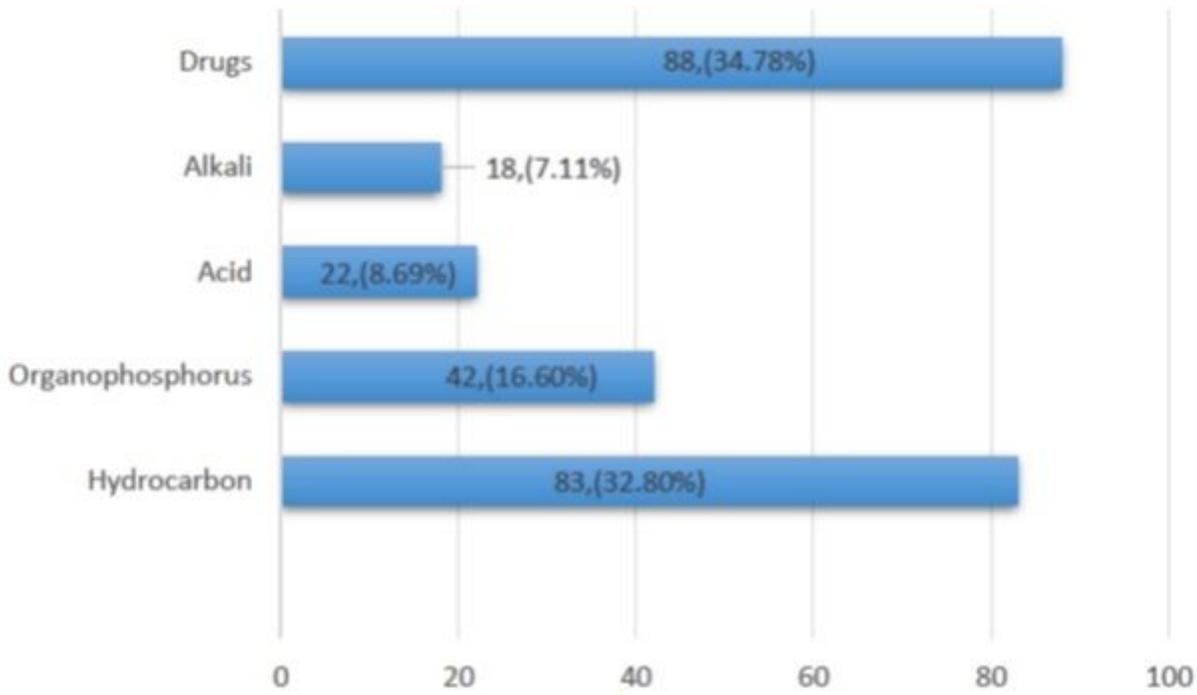


Figure 1

Frequency and Type of Poison

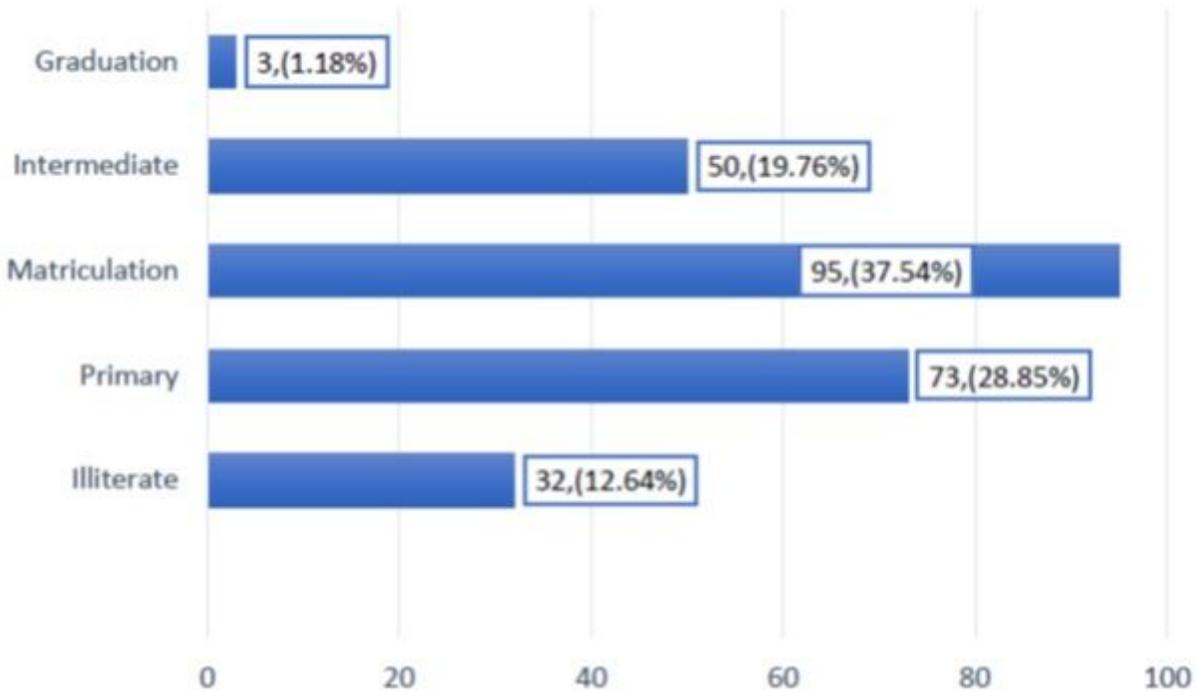


Figure 2

Frequency of Maternal Education

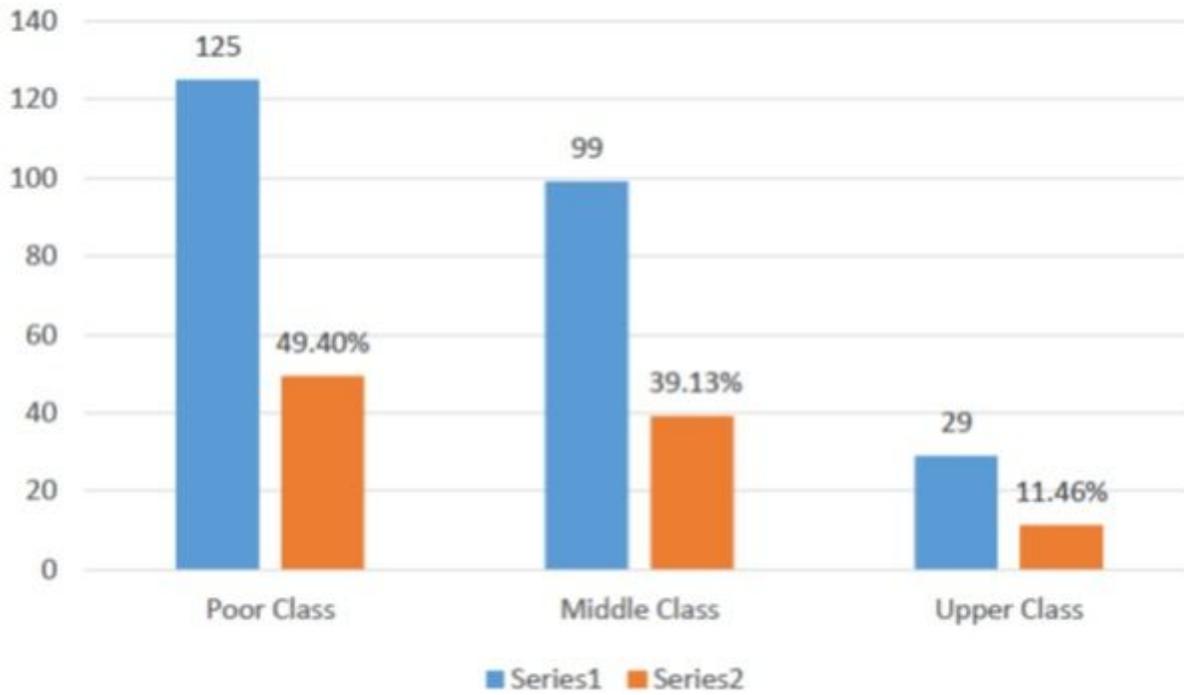


Figure 3

Family Income

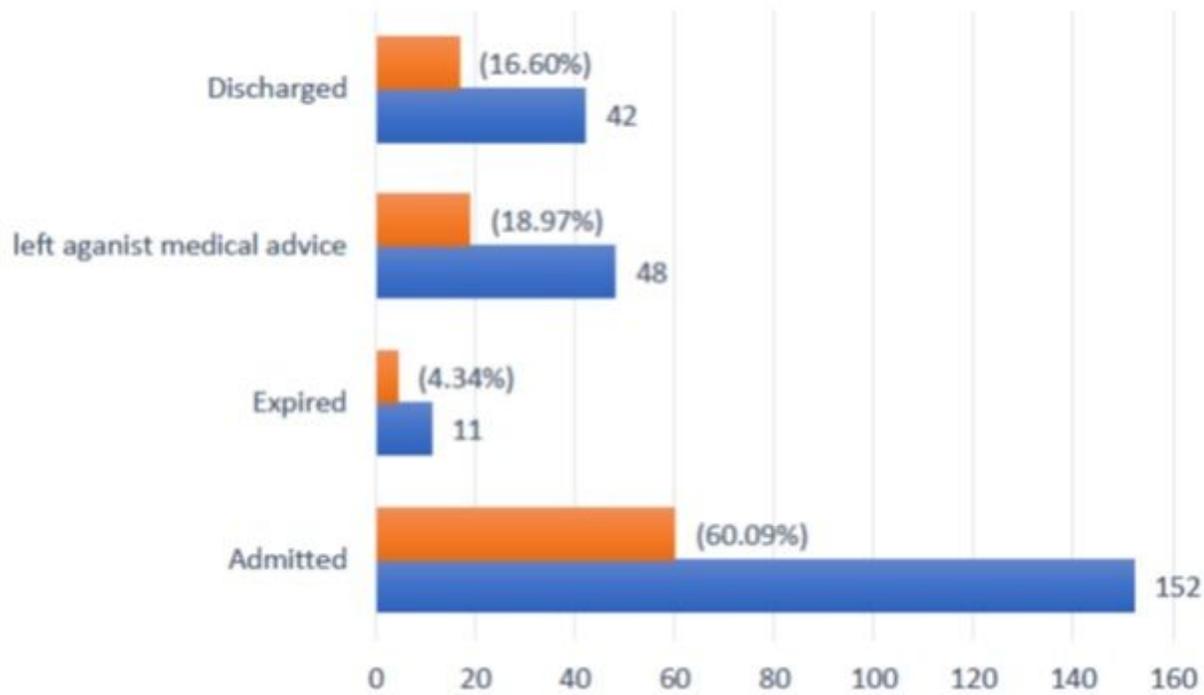


Figure 4

Frequency of Outcome of Poisoning

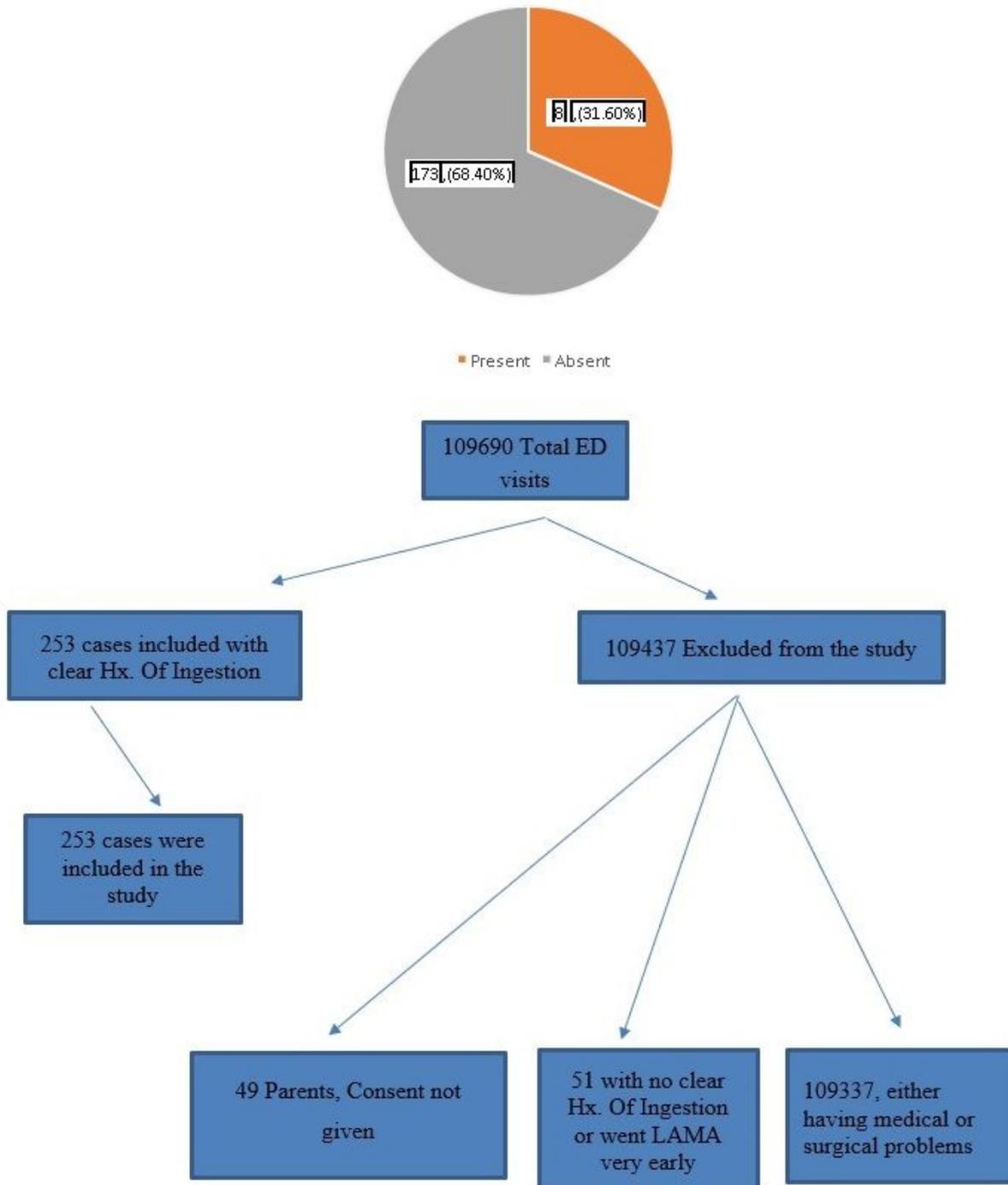


Figure 5

Frequency of Presence of Primary caregiver